

Tribal-EPA technical coordination opportunity: Western Lake Superior Sanitary District mercury variance request

August 20, 2012

Background

Western Lake Superior Sanitary District (WLSSD) provides wastewater treatment for a 530-square mile region in northeastern Minnesota. The facility treats approximately 50% industrial waste and 50% commercial and domestic waste. Maximum design flow is 48.4 million gallons/day. Average effluent discharge rate is 37.2 million gallons/day. Effluent is discharged into St. Louis Bay, which is listed on Minnesota's 303(d) list of impaired waters for PBT (dioxins), mercury, PCBs, and fecal coliform.

The Minnesota Pollution Control Agency (MPCA) is preparing to reissue WLSSD's National Pollutant Discharge Elimination System permit. In February, MPCA informally shared with EPA's Water Quality Branch the draft permit and documentation supporting the mercury variance request. Below is a summary of the proposed permit and the situation at WLSSD.

Overview

WLSSD has requested, and MPCA proposes to grant, a variance from mercury water quality criteria, including the Great Lakes Initiative (GLI) wildlife criterion (1.3 ng/l) and the GLI human health criterion (1.8 ng/l). Interim mercury limits would be set at 5.8 ng/l and 1062 mg/day (monthly average) and 7.4 ng/l and 1355 mg/day (daily maximum). Final mercury limits of 1.8 ng/l and 329 mg/day (calendar month average) and 3.2 ng/l and 585 mg/day (daily maximum) would take effect when the permit expires.

Mercury reduction at WLSSD

WLSSD has worked since the early 1990s to reduce mercury in its effluent and has realized substantial improvement; whereas mercury effluent levels routinely ranged from 200 – 600 ng/l in 1990, recent monthly average levels have consistently hovered near 1.8 ng/l. To achieve these reductions, the District:

- Worked with dentists to install amalgam traps, supported public thermometer collection, mercury-waste collection, and public education campaigns, and developed partnerships with area medical and educational facilities.¹

¹ WLSSD's "Blueprint for Mercury Elimination: Mercury Reduction Project Guidance for Wastewater Treatment Plants," is available online at: http://www.wlssd.com/WLSSD_Blueprint_Mercury_Reduction.pdf.pdf. The document includes recommendations and chronicles, in more detail, the District's outreach work to reduce mercury in its effluent.

- Implemented discharge restrictions through its pretreatment program to reduce mercury load from industrial users. All users discharge below the 100 ng/l pretreatment limit.
- Upgraded total suspended solids removal capacity. Since mercury is often adsorbed onto particulates, these improvements have enhanced the District's ability to remove mercury. Average mercury removal efficiency at WLSSD from 2009-10 was roughly 97%. (According to a recent study by the National Association of Clean Water Agencies, this would place WLSSD among the top performers in percent mercury reduction, nationwide.)

Recent study has shown that roughly 60% of WLSSD's remaining effluent mercury is dissolved (*i.e.* would pass through a 0.45-micron filter). To remove most of the remaining mercury from the waste stream, WLSSD would have to implement more advanced treatment processes. Under the conditions of the previous permit, the District pilot tested a variety of technologies (including Ferrometrics, Inc.'s MercuryFilter, American Peat Technologies products, aqueous treatment chemicals and sequential reduction/air sparging with scientists from the Coleraine Minerals Research Laboratory at the University of Minnesota, Blue Water Technologies' Blue PRO filter, and membrane filtration). None of the tested technologies enabled WLSSD to consistently comply with the previous permit's 1.8 ng/l and 3.2 ng/l final limits.

Under the draft permit, WLSSD is required to continue to test end-of-pipe mercury reduction technologies to determine whether implementation of additional treatment could lead to compliance with the water quality-based effluent limit (WQBEL). WLSSD will be required to test the efficacy of both granular activated carbon and membrane filtration with chemical addition.

Environmental impact

The primary concern with respect to additional mercury in WLSSD's effluent is the potential for increased bioaccumulation in fish tissue, which could present added risk to fish consumers, both wildlife and human. If EPA approves WLSSD's variance from mercury water quality criteria, for the life of the permit, wildlife and human health designated uses will not be protected to the degree that they would if WLSSD were to meet the 1.3 ng/l and 1.8 ng/l GLI criteria.

To better understand the degree to which designated uses may be impacted, it is helpful to examine the additional mercury load that would result from WLSSD's variance. If WLSSD continued to discharge at its present mean discharge rate of 37.2 million gal./day and could comply with the calculated 1.8 ng/l WQBEL, it would release approximately 93 grams of mercury per year into St. Louis Bay. Under the draft permit, WLSSD would be allowed to discharge mercury at a calendar month average of 1,062 mg/day. Over the course of a year, therefore, the facility could discharge roughly 388 grams of mercury. The difference between 388 grams/yr. and 93 grams/yr., multiplied by the number of years that the permit

would allow increased discharge, represents the additional impact that allowing the variance would have on the environment. Thus, the potential impact can be summarized as $(388 \text{ grams/yr.} - 93 \text{ grams/yr.}) * 5 \text{ yrs.}$, or 1,475 additional grams of mercury.

Built into the 1,062 mg/day limit, however, is the assumption that the facility will discharge at its maximum design flow of 48.4 million gallons/day. It is more probable that WLSSD would continue to operate at its current average discharge rate of 37.2 million gallons/day. Assuming that mercury levels in WLSSD's effluent remain static at 2.9 ng/l (mean monthly average from 2007-10), the facility would release approximately 149 grams of mercury per year. Thus, the *likely* impact of granting WLSSD a variance from applicable GLI criteria for a five-year permit term can be summarized as $(149 \text{ grams/yr.} - 93 \text{ grams/yr.}) * 5 \text{ yrs.}$, or 280 additional grams of mercury.

As WLSSD implements strategies for reducing its mercury discharge and seeks to comply with final permit limits, the quantity of mercury released into St. Louis Bay is likely to fall. Therefore, actual additional impact may be less than that outlined above.

Context

Approval of WLSSD's mercury variance will result in a greater quantity of mercury discharged from WLSSD into St. Louis Bay and Lake Superior than would be allowed if no variance were granted.

However:

- Since there is no known technology that would enable WLSSD to consistently meet the 1.3 ng/l criterion, it is only hypothetically possible that WLSSD could operate without a variance.
- Membrane filtration, believed to be the most promising treatment technology, would consume energy in the reduction of mercury in the plant's effluent. According to WLSSD's analysis, the mercury released in the production of this energy would outweigh the quantity removed from the plant's effluent.
- If WLSSD were to cease operations, users would continue to generate wastewater, which would contain mercury. Mercury load to the environment would not be expected to change if users installed septic systems.
- Approval of the requested variance will not allow an increase in mercury discharge relative to the current load.
- The allowable discharge constitutes less than one-tenth of one percent of the total mercury introduced to the Lake by tributaries and atmospheric deposition.

Rolfhus *et al.* (2003) estimate that Lake Superior's tributaries are responsible for delivering 280 kg total mercury per year and that atmospheric deposition is responsible for an additional 740 kg per year.² If WLSSD were to discharge the maximum allowable 388 grams of mercury per year, that contribution would represent 0.14% of the total mercury load delivered by Lake Superior tributaries, 0.052% of the total mercury load associated with atmospheric deposition, and 0.038% of the combined atmospheric and tributary total mercury load. If WLSSD were to continue to discharge according to current conditions (*i.e.* 149 grams of mercury per year), the WLSSD-associated load would comprise 0.053% of the annual tributary total mercury load, 0.020% of the annual atmospheric deposition total mercury load, and 0.015% of the total atmospheric and tributary load.

Status

EPA is awaiting additional detail on WLSSD's finances and pollutant minimization plan. Once the Agency receives this information, staff will be better able to determine whether the variance request is approvable. In the meantime, as part of the Agency's efforts to consult with tribes on decisions that may impact tribal interests, EPA is reaching out to potentially impacted tribes to identify concerns and determine whether formal consultation may become necessary.

² Rolfhus, K. R., Sakamoto, H. E., Cleckner, L. B., Stoor, R. W., Babiarz, C. L., Back, R. C., Manolopoulos, H., Hurley, J. P. *Environ. Sci. Technol.* **2003**, 31, 942-947. Available online at: <http://pubs.acs.org/doi/pdf/10.1021/es026065e>.